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PATENT SPECIFICATION

412,217



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PROVISIONAL SPECIFICATION.

Improvements in and relating to Control Systems for Colour Lighting Apparatus.

We, WM. HILL & SON AND NORMAN & BEARD LIMITED, a British company, of 372, York Road, London, N. 7, HOLOPHANE LIMITED, a British company, 5 of Elverton Street, Vincent Square, London, S.W. 1, HERBERT LA FRENCH NORMAN, a British subject, of 1, Lochbie, Crouch Hill, London, N. 4, and ROLLO GILLESPIE WILLIAMS, a British subject, 10 of 60, Elgar Avenue, Tolworth, Surbiton, Surrey, do hereby declare the nature of this invention to be as follows:—

It is desirable in such places as cinematograph theatres to enable the organist to control 15 a colour lighting system to give any of a fairly large range of colours say ten or twelve; it is further desirable that the control should be quick and simple and that it should be possible to pass direct 20 from one colour to another. The object of the invention is to do this where each colour unit consists of three groups of lamps each with a colour filter and with possibly a fourth unfiltered group and the 25 colour changes are effected by contactor controlled reversible electric motor actuated dimmers which have to stop at various positions between full on and off.

To bring the dimmers to the desired 30 position each is controlled by a hunting switch having a pair of contact members separated by insulation and connected to contactors so that when one member is energized the motor is driven in one direction and when the other is energized the 35 motor is driven in the other direction. These members are energised by sliding contacts moved relatively to the contact members by the dimmer motor and located 40 so that the insulation reaches one of the contacts at any particular desired stopping point; thus by supplying current through any particular contact any desired dimmer position can be reached, 45 whatever the starting point of the switch.

The switch can be of any desired construction. For example it may comprise 50 a row of contacts bearing against a flat plate with triangular contact plates separated by a diagonal bar of insulation, the plate and contacts being relatively moved; or the surface thus found may be upon the periphery of a rotating drum.

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But where the dimmer comprises a resistance with a sliding contact actuated by a lead screw, we prefer to use a stationary plate bearing a series of parallel pairs of conducting strips the respective strips of each pair extending from opposite ends of the plate to within a short distance of one another, while the contacts are arranged on a bar traversed by a lead screw geared to the dimmer lead screw. For each end position (i.e. full on and off) one almost full length strip only is required. The pairs of strips or the contacts may be separately mounted and adjustable endwise to enable the exact stopping points of the dimmer to be adjusted.

The contacts of these various dimmer position switches are led to other contacts by which circuits can be closed by the action of the members to be actuated by the organist, which are for example conveniently in the form of organ keys. To prevent the setting up of undesired circuits which might lead to damage the keys are preferably arranged to close the circuits of relays which close the other contacts referred to. Further to ensure that only one key is effective if more than one is pressed the key contacts may be supplied from a common source and are arranged to break the supply to the keys to one side so that only the depressed key nearest the supply side is effective. This may be done by arranging each key to actuate a member moving between two contacts one leading the supply to the relay when the key is depressed and the other leading the supply to the next member when the key is in released position. Instead mechanical devices of known kind (as used e.g. in cash registers and calculating machines) may be used to prevent more than one key from being depressed at a time. Further a mechanical or electrical latch is provided to maintain the desired circuits closed though only momentary pressure is applied to a key and to restore all other keys or circuits when another key is depressed. Finally a further key may be provided which when depressed cuts off the whole supply thus extinguishing the lights.

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Dated this 21st day of December, 1932.

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## COMPLETE SPECIFICATION.

## Improvements in and relating to Control Systems for Colour Lighting Apparatus.

We, WM. HILL & SON AND NORMAN & BEARD LIMITED, a British company, of 372, York Road, London, N. 7; HOLOPHANE LIMITED, a British company, 5 of Elverton Street, Vincent Square, London, S.W. 1, HERBERT LA FRENCH NORMAN, a British subject, of 1, Lochbie, Crouch Hill, London, N. 4, and ROLLO GILLESPIE WILLIAMS, a British subject, 10 of 60, Elgar Avenue, Tolworth, Surbiton, Surrey, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the 15 following statement:—

This invention relates to the control of colour lighting equipment of the type in which each set of equipment comprises a plurality of coloured light sources, (say 20 three or four groups of lamps some or all with colour filters) controlled by electric motor actuated dimmers themselves controlled say through contactors. For each colour effect the actuating motor or motors 25 must stop with each dimmer in an appropriate position, usually between full on and off. Theoretically an infinite number of effects is possible but in practice in a public hall such as a cinematograph 30 theatre, a relatively small number, for example twelve, is sufficient. The object of the present invention is to provide a control system in which the operator is given manually operated controlling means 35 adapted to give a plurality of definite colour effects, for example a key board with one key for each desired colour effect, the system being so arranged that the operator can pass from any one colour 40 effect to any other in any order. Whenever the controlling means is operated to produce a change, the colour effect will change in a smooth and gradual manner directly from that in operation to that to 45 which the change is made. The system is further designed so that in the case of a keyboard if more than one key is depressed at a time only one key is effective; further only instantaneous depression is necessary, the effect continuing 50 until another key is depressed or until the system is switched off.

A keyboard control according to the invention is particularly suitable for use where it is desired to give the control to the organist but the controlling means can be located for use by any other person as may be desired.

Briefly stated the invention consists in the combination with each motor actuated dimmer of a hunting switch actuated in conjunction with and controlling the dimmer and manually operated means adapted to give the desired definite colour effects by simultaneously energising and determining the stopping points of every such switch. The invention further consists in the combination with each motor actuated dimmer of a hunting switch actuated in conjunction with and controlling the dimmer and a set of keys each of which is adapted to determine the stopping points of every hunting switch whereby a definite colour effect is obtained by each key. The invention also consists in the combination with each motor actuated dimmer of a direct acting hunting switch actuated in conjunction with and controlling the dimmer and manually operated controlling means adapted to give the desired definite colour effects by determining the stopping points of every such switch. By hunting switch we mean a switch which is moved by or in conjunction with a driven member in such a way that when the switch is energised the driven member proceeds to a definite stopping point determined by the switch irrespective of the starting point of the driven member. By direct acting hunting switch we mean a hunting switch as just defined in which the switch does not act by bringing a differential or bridge circuit gradually to a balanced condition at the stopping point, but one which switches the appropriate circuit full on until the stopping point is reached and there opens the circuit controlled by it.

The invention includes further features which are described below with reference to the accompanying diagrammatic drawings which illustrate a system according to the invention provided with

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key control.

Figure 1 is a diagram illustrating the general principles of the invention.

Figure 2 is a plan view showing a detail of a hunting switch suitable for use with the invention and

Figure 3 is a further diagram of a system requiring only a single hunting switch.

Referring now to Figure 1 there is a hunting switch for each dimmer 2, the whole being controlled by a set of keys 3. Each dimmer has a motor 4 controlled by two contactors 5<sub>1</sub> and 5<sub>2</sub> one for each direction of rotation. These contactors are respectively connected to two triangular plates 6<sub>1</sub> and 6<sub>2</sub>, mounted upon the switch plate 1 with a diagonal strip of insulation 7 between them. Coacting with the plates 6<sub>1</sub>, 6<sub>2</sub> is a row of brushes 8 one brush for each required position of the dimmer.

In this figure screw operated dimmers are used, the switch plates being slidably mounted and carrying the dimmer brushes 2<sub>b</sub> so that the plates and brushes move together, while the brushes 8 are stationary. It will be understood that considerable variation in detail can be made. For example the switch plates might remain stationary and the brushes 8 and the dimmer brushes 2<sub>b</sub> be moved; the dimmer might be of some other type and the switch plate might be a cylinder. The essential thing is that when the dimmer is actuated by its motor a corresponding relative movement between the switch plates and brushes 8 must take place.

The direction of this relative motion must be such that whenever one of the brushes 8 is made live, the insulation 7 is brought towards that brush; when it arrives there the supply to the contactor is cut off, the motor stops and the dimmer remains in the corresponding position. It will be seen that by energising the appropriate brushes on each switch the various dimmers can be brought to any of the available positions producing for each position a corresponding colour effect in the lighting equipment 9; further that by energising a new brush on each dimmer the dimmers will move directly to the corresponding new positions while the colour effect will dissolve from that in operation to the new one.

As above stated the control is effected by a set of keys 3 each key when depressed causing a corresponding group of brushes 8 (one in each switch) to be energised. To prevent undesired circuits from being set up i.e. to prevent more than one brush 8 in any one switch from being energised simultaneously the keys do not

directly close the brush circuits but do this through relays 8<sub>r</sub>. In the case of an electrically controlled organ these relays and also the brushes 8 may conveniently be excited by the usual low tension supply used in the organ. In Figure 1 only a few of the connections from the relays to the brushes 8 are shown for the sake of simplicity.

To ensure that only one key is effective should more than one be depressed, the low tension supply to the relays 8<sub>r</sub> may be through a series of springs 10 so arranged that the depression of one key cuts off the supply to all keys to one side of it, (in the drawing those to the right). Each spring 10 is connected to its key and works between a pair of contact springs 11, 12. When the key is in un-depressed position its spring 10 is against the left hand contact spring 11 through which the supply is carried to the next key to the right; when a key is depressed its spring 10 leaves the contact spring 11, thus cutting off the supply to all keys to the right, and touching the right hand contact spring 12 energises the corresponding relay 8<sub>r</sub> and thereby the corresponding brushes 8.

Instead of using electrical means as just described, mechanical devices are known in the construction of cash registers and other calculating machines can be used to prevent depression of more than one key at a time.

If only springs 10, 11, 12 are provided for each key, any key must be kept depressed until the corresponding colour effect is reached. It is desirable however that only momentary depression should be necessary and this can be effected by means of mechanical or electrical locks. For example there may be a common mechanical catch for all keys (similar to that used in some telephone switchboards and cash registers) which holds any depressed key locked but releases it during depression of any other key.

Conveniently however the keys are arranged to remain down when depressed as by friction or light toggle springs, but in the case if any key to the right of a depressed key in Figure 1 is to be used, the depressed key must be raised manually to provide a supply of current to the key which is to be used. This may be avoided by the electrical means shown in Figure 1. Here each key has a further pair of contact springs 13, 14 which are closed when the key is depressed and energise a corresponding separate cancelling relay 15. This relay when energised, excites releasing magnets 16 one of which acts on every key except the key being depressed and causes any other key

to be raised if in depressed position. These magnets 16 may be supplied from the same source as the relays. The springs 13 are permanently connected to the low 5 tension supply so that the interruptions produced in the key circuits on depression of a key and due to the arrangement of the contact springs 10, 11, 12 do not affect the cancelling operation. To prevent waste of current the spring 12 may be strong enough to lift the spring 13 out of contact with spring 14 when finger pressure on the key is released, the cancelling operation only requiring momentary 10 contact.

There may be a further key 3a which when depressed cuts off the supply of current to the other keys and also actuates a relay 20 breaking the circuit 20 of the supply to the lighting equipment.

Figure 2 shows a convenient method of constructing the switch plate. Here there are three strips of metal for each brush 8 except the two outside brushes. The 25 central strips 17 are connected to the corresponding contacts of the relays 8r. One side strip 18<sup>a</sup> is connected to the contactor 5o and the other strip 18<sup>b</sup> to the corresponding contactor 5o. The side strips 30 are of such length as to leave a space where the brush 8 can be out of contact with both, while for the extreme positions of the switch only two strips will be required. The strips may be adjustable 35 longitudinally for obtaining exact adjustment of the stopping points. It will readily be understood that this arrangement is electrically equivalent to that shown in Figure 1 and that as in that 40 Figure, the relay contacts might be connected directly to the brushes (as by flexible leads) when the strip 17 would be omitted.

Figure 3 shows an arrangement where 45 only a single switch is necessary. Here all the dimmers 2 (three are shown as an example) are controlled by cams 19 rotated by a single motor 4, these cams being designed to produce a series of desired colour effects. Since there is only one motor, only a single hunting switch 1 is required, but it is provided with as many brushes 9 as there are keys, twelve being shown as an example. The keys 50 and relays have been omitted from the drawing as they can be arranged as in Figure 1, though since there is only one brush 8 for each colour effect the relays 8r might be dispensed with and the key 55 lines taken straight to the brushes 8. The relays 8r could also be dispensed with in Figure 1 if care were taken to keep the lines from any one key 3 quite separate when the key is undepressed.

Having now particularly described and

ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. In a colour lighting system of the kind set forth, the combination with each motor actuated dimmer of a hunting switch actuated in conjunction with and controlling the dimmer and manually operated means adapted to give the desired definite colour effects by simultaneously energising and determining the stopping points of every such switch. 70

2. In a colour lighting system of the kind set forth, the combination with each motor actuated dimmer of a hunting switch actuated in conjunction with and controlling the dimmer and a set of keys each of which is adapted to determine one of the stopping points of every hunting switch whereby a definite colour effect is obtained by each key. 80

3. In a colour lighting system of the kind set forth, the combination with each motor actuated dimmer of a direct acting hunting switch actuated in conjunction with and controlling the dimmer and manually operated controlling means adapted to give a plurality of definite colour effects by determining the stopping 90 points of every such switch. 95

4. Control apparatus for colour lighting systems according to claim 1, 2 or 3 in which each hunting switch comprises a pair of triangular conducting plates separated by a diagonal band of insulation (or electrical equivalent of such plates and insulation), a transverse set of brushes one for each stopping position, the plates of each switch being connected 100 each to one of two motor controlling contactors one for each direction of rotation of the motor, and gearing connecting the motor and switch for producing relative movement between the plates and brushes 110 to move the insulation towards any brush which may be energised.

5. Apparatus according to claim 4 in which instead of coacting with triangular plates each brush coats with one contact 115 strip for each direction of rotation required to be effected through such brush, each brush being energised if desired by a further strip which may be between the other two when two directions of rotation 120 are required or beside the other one when only one direction of rotation is required.

6. Apparatus according to any preceding claim in which the switch or switches are controlled through relays. 125

7. Key controlled apparatus according to any preceding claim in which each key when actuated cuts off the supply of current to all those to one side of it.

8. Key controlled apparatus according 130

to any preceding claim in which only momentary depression of a key is necessary, the key automatically remaining in action as long as the colour effect it produces is required.

9. Apparatus according to claim 8 in which the depression of any key causes restoration of any other depressed keys to inoperative position.

10. Control apparatus for colour light-

ing systems substantially as described with reference to the accompanying drawings.

Dated this 21st day of December, 1933.  
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*[This Drawing is a reproduction of the Original on a reduced scale.]*

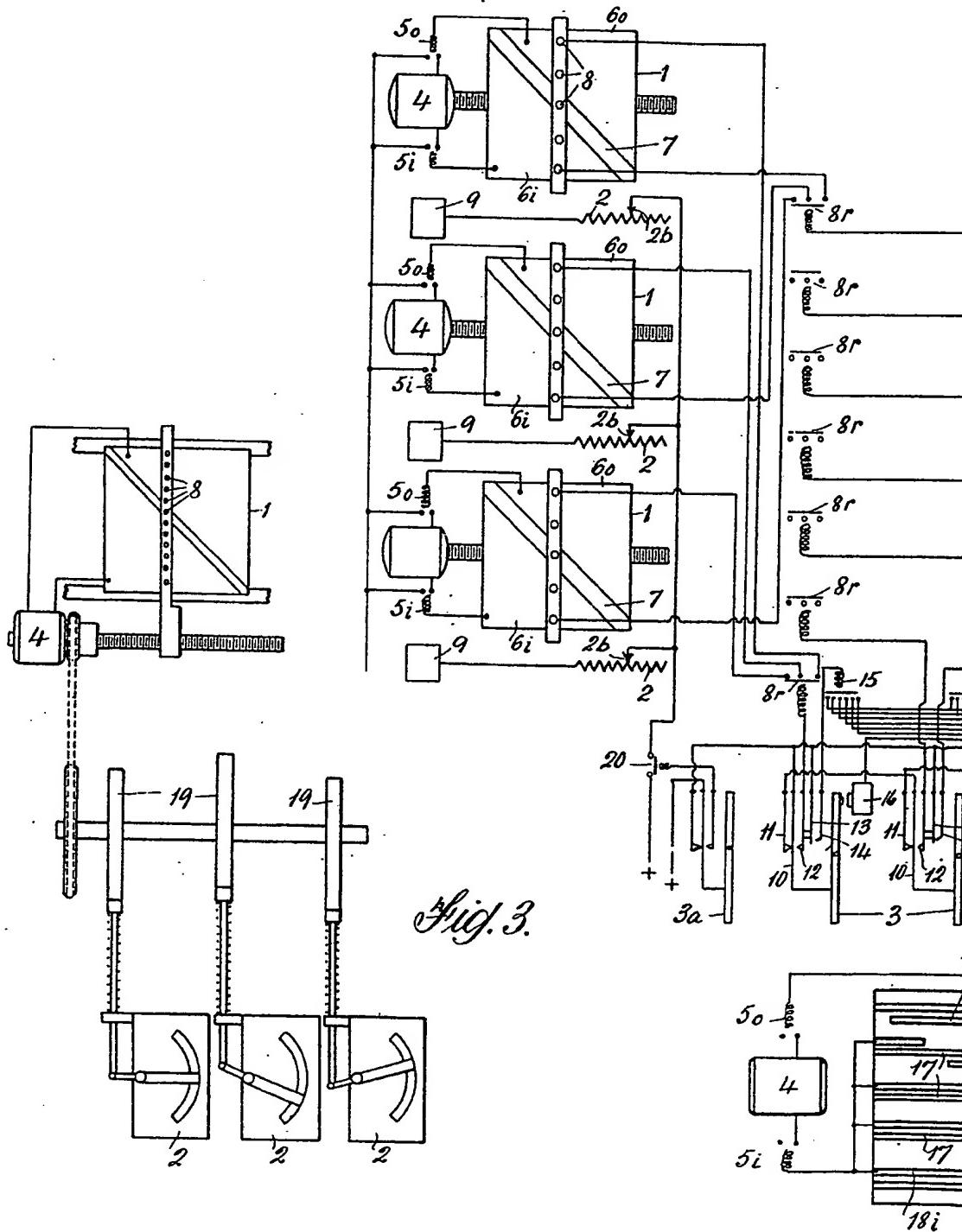


Fig. 1.

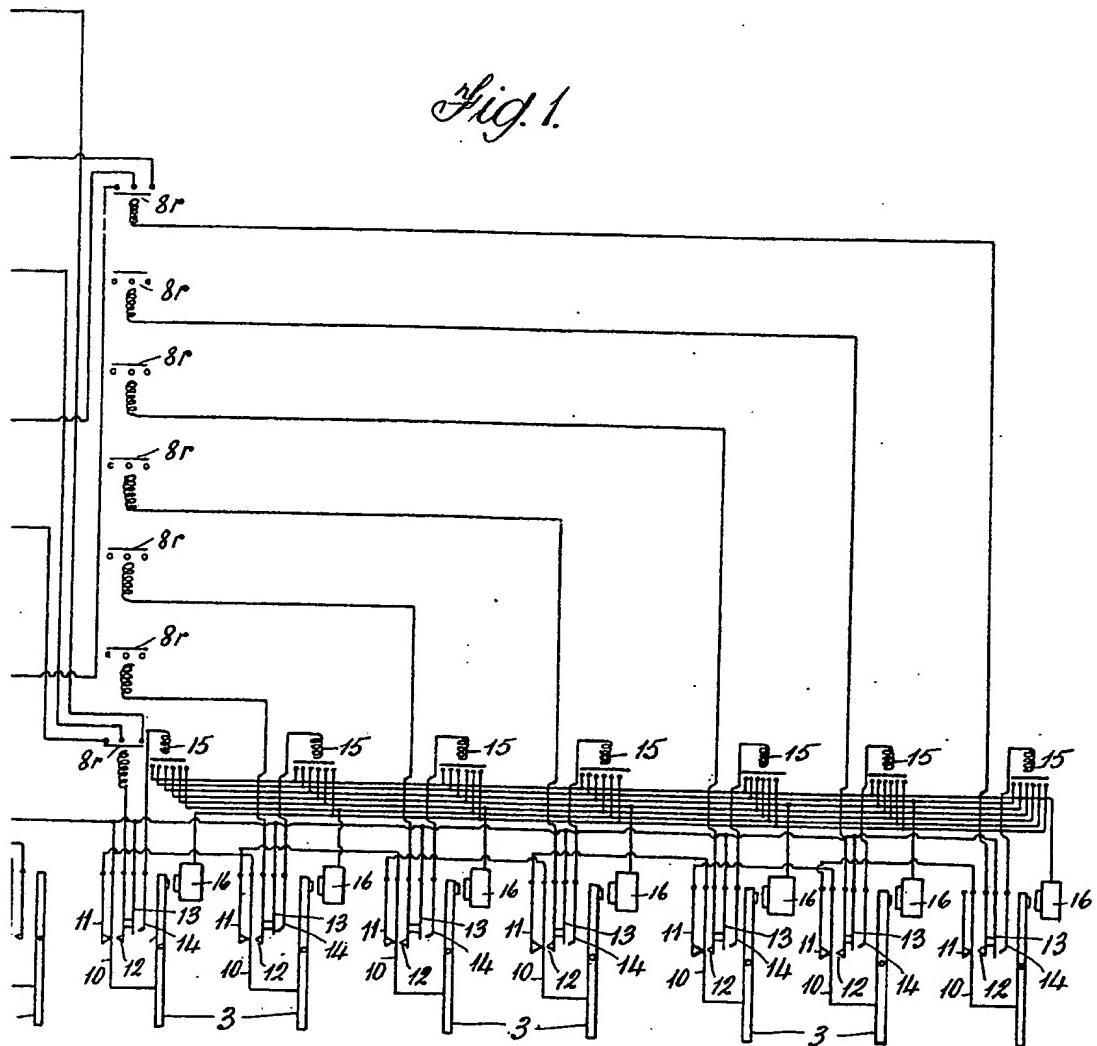
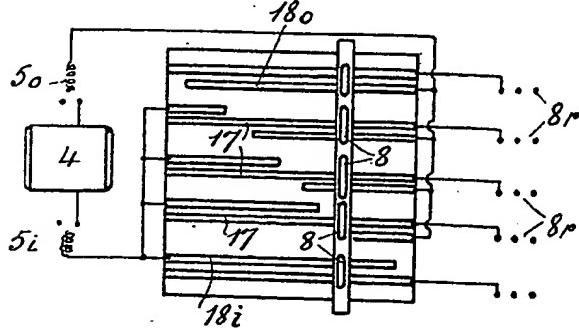
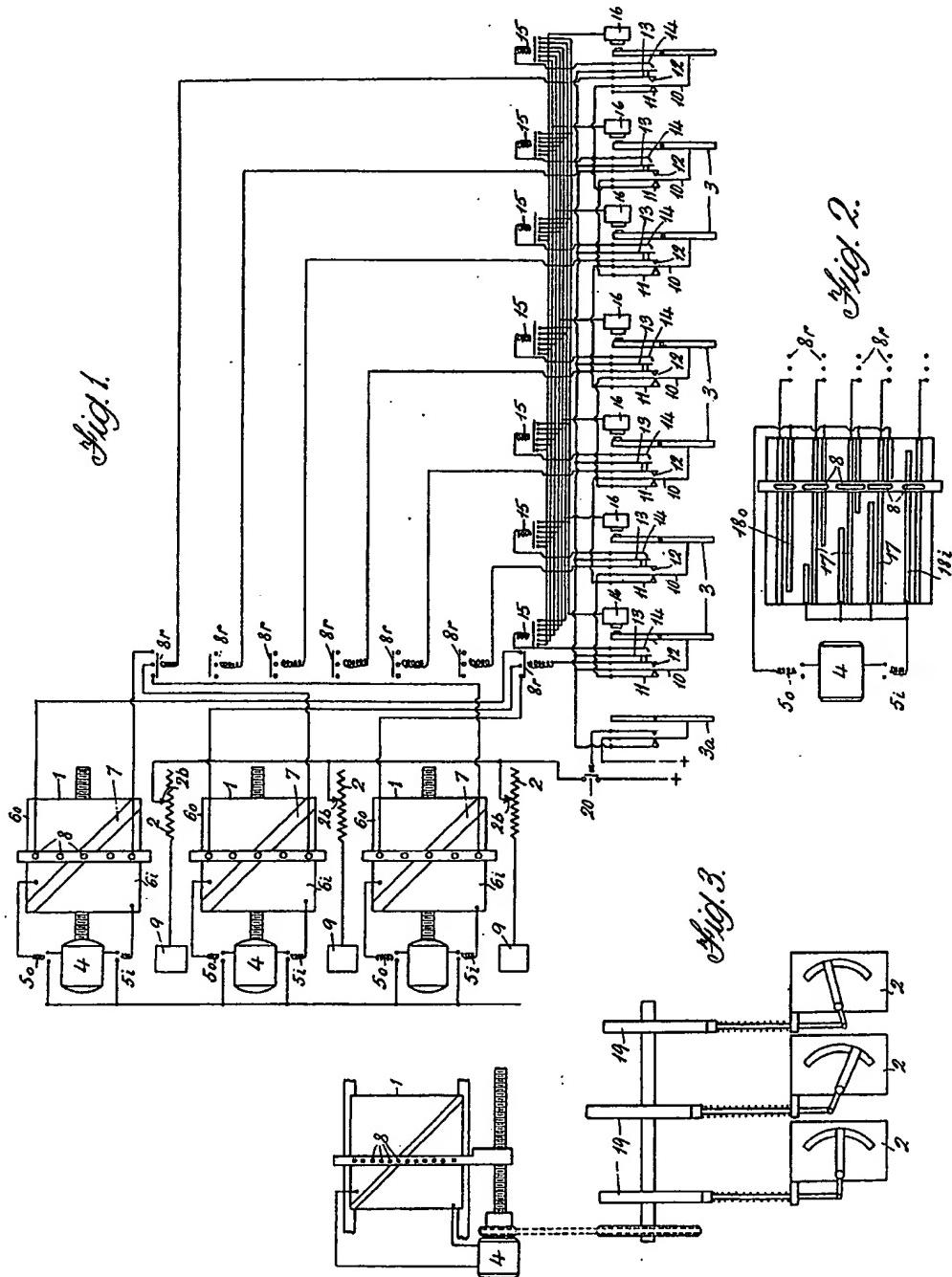


Fig. 2.





(This Drawing is a reproduction of the Original on a reduced scale.)